What is claimed is:

1   1.   A method of determining data placement for a distributed storage system
2   comprising the steps of:
3   selecting a heuristic class which meets a performance requirement and
4   which provides a replication cost that is within an allowable limit of a
5   minimum replication cost; and
6   instantiating a data placement heuristic selected from a range of data
7   placement heuristics according to the heuristic class.

1   2.   The method of claim 1 wherein the performance requirement comprises a bi-
2   modal performance metric.

1   3.   The method of claim 2 wherein the bi-modal performance metric comprises a
2·   criterion and a ratio of successful requests to total requests.

1   4.   The method of claim 1 wherein the data placement heuristic comprises a
2   computer implemented technique of placing data objects onto nodes of the
3   distributed storage system.

1   5.   The method of claim 4 further comprising the step of evaluating a placement
2   of the data objects.

1   6.   The method of claim 5 wherein the step of evaluating the data placement
2   heuristic provides a performance result and a cost result for the system
3   configuration and the workload.

1   7.   The method of claim 5 wherein the step of instantiating the data placement
2   heuristic comprises simulating an instantiation of the data placement heuristic.

1   8.   The method of claim 7 further comprising the steps of:
2   selecting a second heuristic class for the workload and a second system
3   configuration;
4   instantiating a second data placement heuristic according to the second

5   heuristic class; and

6   evaluating a second placement of the data objects made according to

7   ,   the second data placement heuristic.

1   9.   The method of claim 7 further comprising the steps of:

2   selecting a second heuristic class for the system configuration and a

3   second workload;

4   instantiating a second data placement heuristic according to the second

5   heuristic class; and

6   evaluating a second placement of the data objects made according to

7   the second data placement heuristic.

1   10.   The method of claim 5 wherein the step of instantiating the data placement

2   heuristic comprises instantiating the data placement heuristic on an actual

3   distributed storage system operating with an actual workload.

1   11.   The method of claim 10 further comprising the steps of:

2   selecting a second heuristic class for the system configuration and the

3   actual workload;

4   instantiating a second data placement heuristic according to the second

5   heuristic class; and

6   evaluating a second placement of the data objects made according to

7   the second data placement heuristic.

1   12.   The method of claim 1 wherein the performance requirement comprises a data

2   access latency.

1   13.   The method of claim 1 wherein the performance requirement comprises an

2   average data access latency.

1   14.   The method of claim 1 wherein the performance requirement comprises a data

2   access bandwidth.

1   15.   The method of claim 1 wherein the performance requirement comprises a data

2   update time.

1   16.   The method of claim 1 wherein the step of selecting the heuristic class
2   determines a plurality of heuristic parameters.

1   17.   The method of claim 16 wherein the step of instantiating the data placement
2   heuristic instantiates the data placement heuristic according to the heuristic
3   parameters.

1   18.   The method of claim 17 wherein the step of instantiating the data placement
2   heuristic sets other heuristic parameters to defaults.

1   19.   The method of claim 1 wherein the replication cost comprises data storage
2   cost.

1   20.   The method of claim 1 wherein the replication cost comprises a replica
2   creation cost.

1   21.   The method of claim 20 wherein the replication creation cost comprises a
2   network bandwidth cost for transferring replicas and replica changes.

1   22.   The method of claim 20 wherein the replica creation cost comprises a system
2   load cost for running the data placement heuristic.

1   23.   A method of determining data placement for a distributed storage system
2   comprising the steps of:
3   selecting a heuristic class which meets a performance requirement and
4   which provides a replication cost that is within an allowable limit of a
5   minimum replication cost;
6   instantiating a data placement heuristic selected from a range of data
7   placement heuristics according to the heuristic class; and
8   evaluating a placement of data objects onto nodes of the distributed
9   storage system made according to the data placement heuristic.

1   24.   The method of claim 23 wherein the step of instantiating the data placement
2   heuristic comprises simulating instantiation of the data placement heuristic.

1   25.   The method of claim 23 wherein the step of instantiating the data placement
2   heuristic comprises instantiating the data placement heuristic on an actual
3   distributed storage system operating with an actual workload.

1   26.   A method of determining data placement for a distributed storage system
2   comprising the steps of:
3   selecting a heuristic class which meets a performance requirement and
4   which provides a replication cost that is within an allowable limit of a
5   minimum replication cost;
6   instantiating a data placement heuristic selected from a range of data
7   placement heuristics according to the heuristic class;
8   evaluating a placement of data objects onto nodes of the distributed
9   storage system made according to the data placement heuristic; and
10   iteratively performing the steps of selecting the heuristic class,
11   instantiating the data placement heuristic, and evaluating the placement of
12   the data objects.

1   27.   The method of claim 26 wherein second and subsequent performance of the
2   steps of selecting the heuristic class, instantiating the data placement heuristic, and
3   evaluating the placement of the data objects seeks to improve the data placement
4   heuristic.

1   28.   The method of claim 26 wherein second and subsequent performance of the
2   steps of selecting the heuristic class, instantiating the data placement heuristic, and
3   evaluating the placement of the data objects seeks to modify the data placement
4   heuristic to account for a changing workload.

1   29.   A computer readable memory comprising computer code for implementing a
2   method of determining data placement for a distributed storage system, the
3   method of determining the data placement comprising the steps of:
4   selecting a heuristic class which meets a performance requirement and

5   which provides a replication cost that is within an allowable limit of a

6   minimum replication cost; and

7   instantiating a data placement heuristic selected from a range of data

8   placement heuristics according to the heuristic class.

1   30.   A computer readable memory comprising computer code for implementing a

2   method of determining data placement for a distributed storage system, the

3   method of determining the data placement comprising the steps of:

4   selecting a heuristic class which meets a performance requirement and

5   which provides a replication cost that is within an allowable limit of a

6   minimum replication cost;

7   instantiating a data placement heuristic selected from a range of data

8   placement heuristics according to the heuristic class; and

9   evaluating a placement of data objects onto nodes of the distributed

10   storage system made according to the data placement heuristic.

1   31.   A computer readable memory comprising computer code for implementing a

2   method of determining data placement for a distributed storage system, the

3   method of determining the data placement comprising the steps of:

4   selecting a heuristic class which meets a performance requirement and

5   which provides a replication cost that is within an allowable limit of a

6   minimum replication cost;

7   instantiating a data placement heuristic selected from a range of data

8   placement heuristics according to the heuristic class;

9   evaluating a placement of data objects onto nodes of the distributed

10   storage system made according to the data placement heuristic; and

11   iteratively performing the steps of selecting the heuristic class,

12   instantiating the data placement heuristic, and evaluating the placement of

13   the data objects.